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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte PAWEL CZUBAROW and JAY SEGAL

Appeal 2008-3336
Application 10/681,040
Technology Center 1700

Decided: December 16, 2008

Before THOMAS A. WALTZ, JEFFREY T. SMITH and
LINDA M. GAUDETTE, *Administrative Patent Judges*.

WALTZ, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants seek review under 35 U.S.C. § 134 from the Examiner's rejections of claims 1-13, 19-31, 35, 36, 40-42 and 51-53 in the Final Office

Action, dated August 10, 2006[1]. This Board has jurisdiction under 35 U.S.C. § 6(b). For the reasons below, the rejections of the Examiner are AFFIRMED.

The invention of the present application is directed to a thermal interface material and a thermal interface tape. Claims 1 and 52 are illustrative and reproduced below:

> 1. A thermal interface material comprising:
>
> a polymer component;
>
> a phase change component mixed with the polymer component; and
>
> greater than about 7% by weight of a non-ionic surfactant mixed with the polymer component and the phase change component.
>
> 52. A thermal interface tape comprising:
>
> a first layer comprising a conductive film, and
>
> a second layer comprising a thermal interface material coupled to the first layer, the second layer comprising greater than about 7% by weight of a non-ionic surfactant, a phase change component, a polymer, and thermally conductive filler, the thermal interface material having a wetting angle of not more than about 80 degrees and a thermal impedance of no more than about 0.115°C in^2/W, at an operating temperature, wherein the thermal impedance of the thermal interface material is ≤ 0.8 x wherein x is the thermal impedance of a comparative

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[1] In the Final Office Action, claims 16-18, 33, 34, 38 and 39 were also rejected. The Examiner withdrew the rejections of these claims in the Answer (Ans. 2), and these claims are now not under review in this appeal.

> thermal interface material having the same composition of the thermal interface material, but containing no surfactant.

The Examiner cites the following prior art references as evidence of obviousness:

Hill	EP 0794227 A2	Mar. 3, 1997
Bunyan	6,054,198	Apr. 25, 2000
Duvall	6,391,442 B1	May 21, 2002
Yamazaki	WO 03/004580 A1	Jan. 16, 2003

The Examiner maintains the following rejections from which Appellants seek review:

1. Claims 1-13, 21, 23-31, 35, 36, 40-42 and 51-53 stand rejected under 35 U.S.C. § 103(a) as obvious over Duvall in view of Yamazaki (Ans. 4).

2. Claims 1-13, 19-31, 35, 36, 40-42, and 51-53 stand rejected under 35 U.S.C. § 103(a) as obvious over Duvall in view of Hill (Ans. 6).

3. Claims 1, 2, 6, 7, 10-13, 19-23, 25, 27, 28, 30, 31, 35, 36, 40-42, and 51-53 stand rejected under 35 U.S.C. § 103(a) as obvious over Bunyan in view of Hill (Ans. 8).

FINDINGS OF FACT (FF)

The following facts are found based on a preponderance of the evidence in the record:

1. Duvall teaches a thermal interface material for use between a heat sink and a heat source. The interface material includes thermally conductive filler particles dispersed in a phase change

material. The phase change material softens and flows at the operating temperature of the heat source, thereby providing good thermal contact with uneven surfaces of the heat source and heat sink. The phase change material includes a polymer component and a melting point component, which adjusts the softening temperature of the phase change material to the operating temperature of the heat source (Abstract).

2. Duvall discloses the phase change material is preferably wax or a wax-like material such as 2-(2-(2-2hydroxyethoxy) ethoxy) ethoxy) ethyl ester (col. 6, ll. 11-27). The wax is included in amounts of 10-80 wt%, preferably 20-60wt% (col. 6, l. 60 – col. 7, l. 3), and has a melting point of 30-120°C (col. 5, l. 61). The polymer component may comprise acrylic polymers or silicone polymers (col. 5, l. 66 – col. 6, l. 11) and is included in amounts of 10-70 wt% (col. 6, l. 61 – col. 7, l. 3). The conductive particles may comprise boron nitride (col. 5, ll. 33-39) and are included in amounts of 10-80 wt% of the material (col. 6, l. 62).
3. Duvall discloses that the thermal conductivity of the thermal interface material may be controlled and optimized by altering the particle size, particle size distribution, and loading of the thermally conductive filler particles (col. 5, ll. 41-44).
4. Duvall discloses the thermal interface material may include wetting agents (col. 7, l. 7).
5. Yamazaki teaches a thermo-conductive composition comprising (a) 100 parts by weight wax, (b) 10-1,000 pbw of a polymer of

formula (I), (c) 10-2,000 pbw thermo-conductive filler, and (d) 0-1,000 pbw of a softener (Abstract). The wax may comprise a fatty acid amide (p. 3, l. 34) such as stearic amide (p. 4, l. 1). There are no particular restrictions on the wax (p. 3, l. 26).

6. Hill teaches a thermo-conductive composition comprising a boron nitride particle and a polymer base material (Abstract). Hill teaches the composition should further comprise nonionic surfactants selected from the class of carboxylic acid amides and carboxylic acid esters (Abstract) in order to provide the material with flow (page 1, lines 49). The surfactant is included in amounts of greater than 1 % (claim 1).
7. Hill further teaches that, in the range of 1-4% surfactant, the thermal conductivity of the thermal conductive composition increases. (*See* Table 1). But for concentrations above about 4.5% surfactant, Hill teaches that the surfactant adversely causes the thermal conductivity of the composition to decrease (p. 3, l. 21). Table 1 of Hill is reproduced below:

Surfactant Addition	1%	2%	3%	4%	5%
Spiral Flow, in.	3.4	5.2	10.5	15.7	27.1
Thermal Conductivity, W/m°K	6.07	7.25	9.68	11.6	10.6

8. Bunyan describes a thermal interface material comprising an interlayer 30 formed of a thermally conductive material (col. 6, ll. 55-57). The interlayer is formulated, in a first embodiment, of a blend of a pressure sensitive adhesive (“PSA”), an α-olefinic thermoplastic component and one or more thermally

conductive fillers (col. 8, ll. 16-24). The PSA component may comprise various acrylic or acrylate polymers (col. 8, ll. 30-34).

9. Bunyan describes the α-olefinic thermoplastic component in the first embodiment of the thermal interface material as a low melt composition (col. 8, ll. 43-44).
10. Bunyan discloses that the thermal and viscometric properties of the thermally conductive material, especially the phase transition temperature and the melt flow index, may be controlled by the ratio of the amounts of the PSA component with the thermoplastic component (col. 8, l. 66 – col. 9, l. 4).
11. Bunyan discloses the thermal interface material generally has a transition temperature from a first phase to a second phase which is within the operating temperature of an electronic component (col. 5, ll. 17-19).
12. The Specification discloses that the phase change component softens or changes phase within a phase change temperature range. The melting point is preferably around the operating temperature of the heat source (Spec. 7, ¶ [0027]).
13. The Specification does not disclose α-olefinic polymers in the examples of suitable phase change components (*see* ¶ [0027]).
14. The Specification lists examples of suitable polymers, including acrylic polymers (Spec. 6, ¶ [0025]).
15. The Examiner states that surfactant insures homogeneous dispersion of a conductive particle ((Ans. 16, 19). Appellants have not disputed this finding.

16. The Examiner states that Vybar 260 (a trade name of an α-olefinic thermoplastic) disclosed in Bunyan as a preferred thermoplastic component is known by those skilled in the art as a wax (Ans. 16). Appellants have not disputed this finding.

PRINCIPLES OF LAW

"Section 103 forbids issuance of a patent when 'the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.'" *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734 (2007).

The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, (3) the level of skill in the art, and (4) where in evidence, so-called secondary considerations. *Graham v. John Deere Co.,* 383 U.S. 1, 17-18 (1966).

"The combination of familiar elements according to known methods is likely to be obvious when it does no more than yield predictable results." *KSR,* 127 S.Ct. at 1739.

"It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition which is to be used for the very same purpose." *In re Kerkhoven,* 626 F.2d 846, 850 (CCPA 1980).

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant. The degree of teaching away will of course depend on the particular facts; in general, a reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant." *In re Gurley,* 27 F.3d 551, 553 (Fed. Cir. 1994).

"The prior art's mere disclosure of more than one alternative does not constitute a "teaching away" from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed in the … application." *In re Fulton*, 391 F.3d 1195, 1201 (Fed. Cir. 2004)

The fact that a prior art reference does not expressly disclose a particular embodiment is not controlling; the question under 35 U.S.C. § 103(a) is not what the references expressly teach, but what they would have suggested to one of ordinary skill in the art at the time the invention was made; all disclosures of the prior art, including unpreferred embodiments, must be considered. *In re Burckel,* 592 F.2d 1175, 1179 (CCPA 1979); *In re Lamberti,* 545 F.2d 747, 750 (CCPA 1976).

"[W]here the Patent Office has reason to believe that a functional limitation asserted to be critical for establishing novelty in the claimed subject matter may, in fact, be an inherent characteristic of the prior art, it possesses the authority to require the applicant to prove that the subject matter shown to be in the prior art does not possess the characteristic relied on." *In re Best,* 562 F.2d 1252, 1254-55 (C.C.P.A. 1977). Where the claimed and prior art products are substantially identical, the PTO can require an applicant to prove the prior art products do not necessarily or inherently possess the characteristics of the claimed product. *Id.* at 1255.

DISCUSSION

1. Obviousness over Duvall in view of Yamazaki

Claims 1-13, 21, 23-31, 35, 36, 40-42 and 51-53 stand rejected as obvious over Duvall in view of Yamazaki. Appellants traverse this rejection by presenting arguments in subgroups of the rejected claims. We present our discussion accordingly.

Claims 1-13, 21, 23-31, 36 and 40-42

The rejection of the claims in this subgroup is traversed collectively by common arguments. Appellants do not argue the claims separately. Accordingly, the claims stand or fall together, with claim 1 as representative. 37 C.F.R. § 41.37(c)(1)(vii). In maintaining the rejection, the Examiner asserts that Duvall teaches a thermal interface material which comprises a polymer component and a phase change material. (Ans. 4). Thermally conductive filler particles are dispersed in the phase change material. The phase change material includes both a polymer and a softening agent, the latter preferably a wax *(id.)*. The Examiner states that Duvall teaches the composition may comprise a wax, but not that at least 7% of the wax may be a surfactant (Ans. 5). The Examiner then contends that Yamazaki discloses a thermo-conductive composition that includes wax, which may comprise a fatty acid amide, such as stearic amide. The Examiner asserts that stearic amide is a non-ionic surfactant. (*Id.*).

The Examiner contends that one of ordinary skill in the art would have found it obvious to substitute part of the wax in Duvall with a stearic amide wax, as taught in Yamazaki, in amounts equal to or greater than 7 wt%. The reason for this substitution would have been the functional equivalence of these waxes. (Ans. 5).

Appellants do not dispute the Examiner's findings as to the materials disclosed in the prior art, and thus we accept these findings as fact. (App. Br. 7-8. *See* FF 1-3 and 5). Appellants dispute the Examiner's conclusion of obviousness to substitute part of the wax in Duvall with stearic amide. Appellants take an all-or-nothing position; either there is no suggestion for substituting any stearic amide for the wax in Duvall, or if there is "functional equivalency," then logic would compel a complete substitution with the stearic amide for all the wax (App. Br. 9). Appellants further contend that they discovered that the combination of nonionic surfactant and phase change component provided "notable technical advantages," particularly increases in peel strength, as being "indicative of nonobviousness" (App. Br. 9).

We find the Examiner's arguments persuasive. Yamakazi teaches that a broad range of compounds, including stearic amide, as well as vegetable-based, animal-based, petroleum-based and synthetic waxes may be used as the wax component. No particular restrictions are placed on the wax disclosed by Yamakazi, as Appellants note. (FF 5, App. Br. 8). In addition, Duvall discloses the invention may further include wetting agents (FF 4), which a skilled artisan would have understood to be surfactant materials. Thus, we determine the various waxes, as disclosed in the similar thermal interface material of Yamazaki, would have been functionally equivalent, and combining them in blends or substituting one for another, including one having surfactant properties, would have been obvious, especially in view of Duvall's teaching that wetting agents (surfactants) may be included in the composition. *Kerkhoven*, 626 F.2d at 850. Appellants' assertions of "notable technical advantages" do not rise to a level of unexpected results. Appellants also compare the advantages of their invention to an "exemplary control mixture without surfactant" in Example 5 (App. Br. 15), but do not provide any explanation establishing that this comparison is with the closest prior art, commensurate in scope with the claimed subject matter, or shows truly unexpected results. *See In re Klosak,* 455 F.2d 1077, 1080 (CCPA 1972); *Ex parte Gelles,* 22 USPQ2d 1318, 1319 (BPAI 1992). Accordingly, we determine that Appellants have not overcome the prima facie case of obviousness established by the Examiner. We further determine that Appellants have failed to show reversible error by the Examiner and the rejection of claim 1, and the other claims by representation, is sustained.

Claim 35

Claim 35 depends on claim 25, rejected above, and further is limited to surfactants in amounts greater than about 10% by weight. As with claim 1, Appellants argue the prior art references do not teach or suggest a partial substitution of wax with stearic amide, either at quantities of 7%, as above, much less 10%, as in this claim (App. Br. 13). We are not persuaded by Appellants' arguments. Duvall teaches the range of wax to be 10-80% (FF

2). Therefore, for the same reasoning of functional equivalence, as discussed above, we determine substituting the stearic amide for part of the wax in excess of about 10% would have been obvious.

Claims 51-52

In addition to limitations similar to claim 1 discussed above, claims 51-52 have further limitations directed to the thermal impedance and wetting angle of the material or a tape made with that material. Specifically, claim 51 claims a material substantially similar to claim 1, having thermal impedance less than 80% of the thermal impedance of a comparative material without a surfactant. Claim 52 likewise has substantially similar elements to claim 1, plus an additional limitation of a wetting angle not more than about 80 degrees and a thermal impedance of no more that about 0.115°C in^2/W, wherein the thermal impedance is less than 80% of that of a comparative material without surfactant.

The additional limitations in claims 51 and 52 are not directed to the structure or composition of the thermal interface material, but rather to functional characteristics exhibited by the material. As the Examiner found, it is well known in the art that wetting angle is proportional to the amount of surfactant added to the composition (Ans. 13). As the Examiner also found, the claimed thermal impedance also would have been achievable through routine optimization of properties of the thermally conductive filler, such as the particle size, distribution and filler loading concentration *(id.)*. We agree with the Examiner's findings, which Appellants do not dispute. From these facts and reasons, we conclude the claimed values would have been obvious to an artisan of ordinary skill.

The Examiner also found that a material so optimized would inherently have a thermal impedance of ≤0.8 of a comparable material with no surfactant, since the surfactant would assure homogeneous dispersion of the conductive particles (Ans. 13). We find the Examiner has provided a reasonable basis to believe the prior art, as optimized for wetting angle and thermal impedance, would inherently exhibit the comparative thermal impedance property. Appellants thus have the burden to show the prior art, as optimized, would not inherently exhibit this property. *Best,* 562 F.2d at 1254-55. This, we find, Appellants have failed to accomplish.

Claim 53

Claim 53 broadly claims a thermal interface material comprising a phase change wax and greater than about 7% by weight of a surfactant. Appellants dispute the Examiner's determinations, repeating the same reasons given for claim 1 (App. Br. 16). For the same reasoning as for claim 1 above, we determine one of ordinary skill in the art would have found it obvious to substitute part of the wax in Duvall with stearic amide from Yamazaki, as functional equivalents.

Accordingly, the first rejection on grounds of obviousness over Duvall in view of Yamazaki is sustained.

2. Obviousness over Duvall in view of Hill

Claims 1-13, 19-31, 35, 36, 40-42 and 51-53[2] stand rejected as obvious over Duvall in view of Hill. Appellants argue the claims of this rejection in subgroups. We thus consider the claims in the same subgroups, as set forth below.

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[2] Claims 16-18, 33, 34, 38 and 39 were also rejected in the Final Office Action over Duvall in view of Hill, but this rejection was withdrawn by the

Claims 1-13, 21-31, 36 and 40-42

For claims 1-13, 21-31, 36 and 40-42, Appellants argue the claims collectively with common arguments. We treat these as a group, to stand or fall together, with claim 1 as representative. 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner relies on Duvall for teaching the same claim limitations as in the rejection over Duvall in view of Yamazaki, again acknowledging that it does not teach at least 7 wt.% non-ionic surfactant (Ans. 7, *See* FF 1). The Examiner cites Hill for teaching a thermal interface composition comprising non-ionic surfactants selected from the class of carboxylic acid amides and carboxylic acid esters (*Id.*). Hill teaches the use of surfactants in excess of 1% (FF 6). The Examiner concluded that one of ordinary skill in the art would have found it obvious to add more than 1% nonionic surfactant to the material in Duvall based on the disclosure in Hill, for the reason of achieving improved flow (Ans. 7).

Appellants do not dispute the Examiner's finding that the two prior art references collectively teach all the elements of the claimed invention, except that the amount of surfactant is greater than 7% (App. Br. 17). Appellants contend that Hill fails to teach surfactant concentrations above about 5%. (App. Br. 17).

Examiner (Ans. 2). Appellants' arguments supporting these claims are therefore moot and are not addressed. At Ans. 3, the Examiner still lists claims "16-31" as rejected over Duvall in view of Hill, but at Ans. 6, only lists claims "19-31". We presume the reference at Ans. 3 to be a typographical error, and claims 16-18 are not under review.

We agree with the Examiner as to the disclosure of the prior art references with respect to the claims at issue. (FF 1, 6). We disagree with Appellants as to the lack of disclosure of the amount of surfactant, finding that Hill broadly teaches amounts of surfactant greater than 1% (FF 6).

In rebuttal of the Examiner's prima facie case of obviousness, Appellants further contend Hill teaches away from use of surfactants greater than about 4.5% (App. Br. 17). To teach away from an asserted obvious combination, the prior art must discourage a skilled artisan from following the path set out in the reference, or the prior art teachings must lead one in a direction divergent from the path that was taken by the applicant. *Gurley,* 27 F.3d at 553. The degree of "teaching away" depends on the particular facts. *Id.* However, a prior art disclosure of alternative embodiments does not teach away from any one embodiment, because such disclosure does not criticize, discredit or otherwise discourage the solution claimed. *Fulton,* 391 F.3d at 1201. Similarly, the disclosure of unpreferred embodiments, even with inferior results, must be considered in determining obviousness. *Burckel,* 592 F.2d at 1179.

Appellants contend Hill teaches away from use of surfactants in concentrations greater than 4.5% (App. Br. 17). Hill states that, according to its Table 1, the addition of surfactant becomes detrimental above 4.5%, with the presence of higher levels of surfactant adversely affecting the thermal conductivity of the composition, causing it to drop (FF 7). However, we determine that the data of Table 5, while consistent with the foregoing assertions, does not necessarily show the decrease in thermal conductivity to be sufficient to discourage use of higher amounts of surfactants. Table 1 illustrates that the thermal conductivity decreases from 11.6 to 10.6 W/m°K while the amount of surfactant increases from 4 to 5% (*see* FF 7). However, the thermal conductivity at 5 % surfactant is still higher than that in the preferred range of 1-3% taught by Hill. Appellants acknowledge Hill teaches use of 1% surfactant (App. Br. 16), which, according to Hill, exhibits a thermal conductivity of only 6.07 W/m°K (FF 7). We do not find that a thermal conductivity of 10.6 W/m°K, even though below the optimum of 11.6 W/m°K at 4% surfactant, would teach away from use of 5% or higher amounts of surfactant. When considered together with the predictable benefits of higher amounts of surfactant, we find that some decrease of thermal conductivity at these higher amounts balanced with the benefits of increased amounts of surfactant would not amount to a "teaching away" of those higher amounts.

Accordingly, the rejection of claim 1 and the other claims by representation is sustained.

Claims 19 and 35

Claims 19 and 35 depend on claims 1 and 25, respectively, adding a common limitation that the thermal interface material comprises a surfactant in amounts greater than 10%. Appellants' sole argument traversing the rejection is that Hill teaches away from amounts of surfactant greater than 4.5% (App. Br. 20). For the same reasons applicable to claims 1 and 25, rejected above, we find Hill does not teach away from amounts of surfactant greater than 4.5%, only that those amounts are less preferred.

Accordingly, the rejection of claims 19 and 35 as obvious over Duvall in view of Hill is sustained.

Claim 20

Claim 20 depends on claim 1, adding a limitation that the thermal interface material comprises a surfactant in amounts between about 14% and 25%. Again, Appellants' sole argument traversing the rejection is that Hill teaches away from amounts of surfactant greater than 4.5% (App. Br. 21). For the same reasons applicable to claim 1, we find Hill does not teach away from the claimed range of surfactant amounts, only that it is not preferred.

Accordingly, the rejection of claim 20 as obvious over Duvall in view of Hill is sustained.

Claims 51 & 52

Appellants traverse the rejections of claims 51 and 52 with the same arguments used in traversing the rejections under Duvall in view of Yamazaki (App. Br. 21-23). Claims 51-52 have further limitations directed to the thermal impedance and wetting angle of the material or a tape made with that material. Specifically, claim 51 claims a material substantially similar to claim 1, having thermal impedance less than 80% of the thermal impedance of a comparative material without a surfactant. Claim 52 likewise has substantially similar elements to claim 1, plus an additional limitation of a wetting angle not more than about 80 degrees and a thermal impedance of no more that about 0.115°C in^2/W, wherein the thermal impedance is less than 80% of that of a comparative material without surfactant.

Regarding claim 51, Appellants contend the prior art references do not teach that the thermal impedance is as claimed, and that the prior art references do not provide explicit evidence that the missing characteristic is necessarily present in the prior art (App. Br. 21-22). Regarding claim 52, Appellants contend the prior art references do not disclose the claimed wetting angle or thermal impedance, nor the claimed amount of surfactant. (App. Br. 22).

Appellants raised these same arguments previously in the rejection of claims 51 and 52 over Duvall in view of Yamazaki (App. Br. 21-23). For the same reasons given in the discussion of that rejection, we likewise find Appellants' argument unpersuasive. As in the previous rejection, we determine the claimed thermal impedance would have been achievable through routine optimization of the properties of the thermal conductive filler, and the claimed wetting angle would have been achievable through routine optimization of the amount of surfactant in the composition. The composition would likely have a thermal impedance less than that of a composition with no surfactant, since the surfactant would assure reasonable dispersion of the conductive particles (FF 14). Thus, there is a reasonable basis to believe the prior art exhibits the claimed properties. The burden thus falls on Appellants to show otherwise. *Best,* 562 F.2d at 1254-55. We determine that Appellants have failed to meet this burden.

Claim 53

As noted previously, claim 53 is an independent claim for a thermal interface material comprising a phase change wax and greater than 7% of a surfactant.

Appellants assert that Hill teaches away from amounts of surfactant greater than 4.5% (App. Br. 23-24). For the same reasons discussed previously, we do not find this argument has merit. Hill merely teaches unpreferred embodiments above 4.5 wt. % surfactant.

Appellants also note that they have discovered the combination of surfactant >7% and a phase change component provide "notable technical advantages". For the same reasons in the rejection of claim 1 over Duvall in view of Yamazaki, we do not view this as rising to the level of unexpected results.

Accordingly, the rejection of claim 53 as obvious over Duvall in view of Hill is sustained.

3. *Obviousness over Bunyan in view of Hill.*

Claims 1, 2, 6, 7, 10-13, 19-23, 25, 27, 28, 30, 31, 35, 36, 40-42 and 51-53 stand rejected as obvious over Bunyan in view of Hill. Appellants present arguments traversing the rejection according to subgroups of the rejected claims.

Claims 1, 6, 7, 10-13, 19-23, 25, 27, 28, 30, 31, 35, 36 and 40-42[3]

Appellants argue for the above subgroup of claims of this rejection collectively, with common arguments. We thus treat the claims as a group, to stand or fall together, with claim 1 as representative. 37 C.F.R. § 41.37(c)(1)(vii).

The Examiner relies on Bunyan to teach the limitations of the rejected claims except for a surfactant. (Ans. 9). The Examiner relies on Hill to teach a thermal conductive molding compound comprising a non-ionic surfactant in amounts greater than 1% (*Id.).*

In response to the rejections, Appellants raise two arguments. Appellants first contend that Bunyan teaches one embodiment, comprising a polymeric component and a phase change component, or another comprising a wax. Bunyan does not teach substituting the wax of the second embodiment for one or the other components of the first embodiment (App. Br. 24-25). Appellants' argument is not persuasive, because representative claim 1 is directed only to: (1) a polymer component, (2) a phase change component, and (3) a surfactant in a specified quantity. The first embodiment of Bunyan is directed to a composition comprising a PSA component, including various acrylic or acrylate polymers (FF 8). The Specification lists suitable polymeric components including acrylic elastomers (FF 14). We find the "polymer component" limitation of claim 1 reads on the PSA component described in Bunyan.

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[3] Appellants also included claims 16-18, 33, 34, 38 and 39 in this group, but which we have omitted because the rejection of these claims was withdrawn by the Examiner (Ans. 2)

The first embodiment also includes an "α-olefinic thermoplastic component." Bunyan describes the α-olefinic polymer as a low-melt composition (FF 9). Bunyan also teaches that the thermal and viscometric properties, especially the phase transition temperature and melt flow index, may be controlled by varying the ratio of the PSA component to the thermoplastic component (FF 10). The invention in Bunyan generally has a transition temperature from a first phase to a second phase which is within the operating temperature of an electronic component (FF 11). In comparison, the Specification teaches that the claimed phase change component softens or changes phase within a phase change temperature range. The melting point is preferably around the operating temperature of the heat source (FF 12). While an α-olefinic polymer is not specifically listed in the examples of phase change components in the Specification (FF 13), it accomplishes the same function in the Bunyan disclosure, namely, that of modifying the transition temperature of the composition. Therefore, we determine the claimed phase change component reads on the α-olefinic polymer disclosed in Bunyan.

Appellants interject a separate argument for claim 25, contending that the PTO relies on the first embodiment of Bunyan to teach the polymer component and phase change component of the composition of claim 1, and the second embodiment to teach the phase change wax of claim 25. Appellants then contend Bunyan teaches use of one or the other in a composition, not both (App. Br. 25). While we agree with Appellants' appraisal of Bunyan's disclosure, we are not persuaded by their argument. Claims 1 and 25 are both independent claims. Aside from a surfactant, claim 1 is limited only to a polymer component and a phase change component, and claim 25 is limited only to a phase change wax. We may use a prior art reference for all that it teaches. *Burckel*, 592 F.2d at 1179. We do not find any error in the Examiner's use of the first embodiment in Bunyan against claim 1 and the second embodiment against claim 25.

Appellants' second argument is that Hill does not teach use of greater than 7% wt. surfactant, and also teaches away from use of more than 4.5% wt. (App. Br. 25). We have addressed this argument above in the prior rejection of Duvall in view of Hill. For the foregoing reasons, we do not find Appellants' arguments persuasive.

Accordingly, the rejection of claim 1 and the represented claims is sustained.

Claim 2

Appellants separately traverse the rejection of claim 2, arguing that neither Bunyan nor Hill teaches a phase change component which is a wax (App. Br. 26). One example of a preferred α-olefinic polymer disclosed in Bunyan, namely Vybar 260, is known by those skilled in the art as a wax

(FF 16). Accordingly, we do not find Appellants' argument persuasive, and sustain the rejection of claim 2.

Claims 19 and 35

Appellants traverse the rejection of claims 19 and 35 by arguing neither of the applied prior art references discloses use of a surfactant greater than 10%, and Hill teaches away from use of surfactant greater than 4.5% (App. Br. 27). As discussed above, we find Hill generically discloses use of surfactant in amounts greater than 1% (FF 6), and discloses use above 4.5% only as a non-preferred embodiment, not as a teaching away (*see* FF 7). We therefore find Appellants' argument unpersuasive.

Claims 51 and 52

Appellants traverse the rejection of claim 51 with the same argument raised in the rejection over Duvall in view of Yamazaki (*see* App. Br. 21-22), namely that the referenced prior art does not teach a thermal interface composition having the claimed thermal impedance, and that extrinsic evidence that such a characteristic is inherent has not been produced *(see* App. Br. 29-30). Claims 51-52 have further limitations directed to the thermal impedance and wetting angle of the material or a tape made with that material. Specifically, claim 51 claims a material substantially similar to claim 1, having thermal impedance less than 80% of the thermal impedance of a comparative material without a surfactant. Claim 52 likewise has substantially similar elements to claim 1, plus an additional limitation of a wetting angle not more than about 80 degrees and a thermal impedance of no more that about 0.115°C in^2/W, wherein the thermal impedance is less than 80% of that of a comparative material without surfactant.

Regarding claim 51, Appellants contend the prior art references do not teach that the thermal impedance is as claimed, and that the prior art references do not provide explicit evidence that the missing characteristic is necessarily present in the prior art (App. Br. 29-30). Regarding claim 52, Appellants contend the prior art references do not disclose the claimed wetting angle or thermal impedance, nor the claimed amount of surfactant. (App. Br. 30-31).

Appellants raised these same arguments previously in the rejection of claims 51 and 52 over Duvall in view of Yamazaki (*see* App. Br. 29-31). For the same reasons given in the discussion of that rejection, we likewise find Appellants' argument unpersuasive. In that previous rejection, we determined the claimed thermal impedance would have been achievable through routine optimization of the properties of the thermal conductive filler, and the claimed wetting angle achievable through routine optimization of the amount of surfactant in the composition. The material would likely have a thermal impedance less than that of a composition with no surfactant, since the surfactant would assure reasonable dispersion of the conductive particles (FF 15). Thus a reasonable basis exists to believe the prior art exhibits the claimed property. The burden thus falls on Appellants to show otherwise. *Best,* 562 F.2d at 1254-55. We determine that they have failed to meet this burden. Accordingly, the rejection of claims 51 and 52 over Bunyan in view of Hill is sustained.

Claim 53

As noted previously, claim 53 is an independent claim for a thermal interface material comprising a phase change wax and greater than 7% of a surfactant.

Appellants contend that Hill teaches away from amounts of surfactant greater than 4.5% (App. Br. 23-24). For the same reasons discussed previously in the rejection of claim 1 over Duvall in view of Hill, we do not find this argument has merit. Hill merely teaches that embodiments with above 4.5% surfactant have lower thermal conductivity values than the optimum, but of course the artisan would have recognized advantages due to the amount of surfactant (*see* FF 7).

Appellants also note that they have discovered the combination of surfactant >7% and a phase change component provide "notable technical advantages". (App. Br. 32). As discussed previously in the analysis of the rejection of claim 1 over Duvall in view of Yamazaki, we do not view this as rising to the level of an unexpected result.

Accordingly, the rejection of claim 53 as obvious over Bunyan in view of Hill is sustained.

CONCLUSION

The first rejection of claims 1-13, 21, 23-31, 35, 36, 40-42 and 51-53 as obvious over Duvall in view of Yamazaki is sustained.

The second rejection of claims 1-13, 19-31, 35, 36, 40-42, and 51-53 as obvious over Duvall in view of Hill is sustained.

The third rejection of claims 1, 2, 6, 7, 10-13, 19-23, 25, 27, 28, 30, 31, 35, 36, 40-42 and 51-53 as obvious over Bunyan in view of Hill is sustained.

Therefore, the decision of the Examiner is affirmed.

TIME PERIOD FOR RESPONSE

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(iv).

AFFIRMED

tc

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